

No. 8.—*Some Amphibians from Northwestern Peru, with a Revision of the Genera Phyllobates and Telmatobius.*

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DURING the summer and autumn of 1916 the junior author served as zoölogist of an expedition to northwestern Peru undertaken in the interests of the School of Tropical Medicine (Harvard University) and the Museum.

This paper is the first of a series dealing with the herpetological collections secured. It is our intention to make these papers more than faunal lists and though it was expected that the deserts of northern Peru would yield few amphibians and that the number of species would be small, the percentage of new forms proves extraordinarily large. Notes on the habits of the species observed, especially of the new marsupial frogs will be included in a later paper.

The expedition crossed the provinces of Piura, Cajamarca, and Lambayeque. The towns of Huancabamba and Palambla are on the western range of the Andes, on the border of Piura. This northern Huancabamba should not be confused with the town of the same name of central Peru near Oxapampa. From the latter several reptiles and amphibians were collected by Enrique Boettger in 1910 and described by Boulenger. Not one of these species was found in the Huancabamba visited. This caused some confusion and after correspondence with Dr. Boulenger and Mr. W. F. H. Rosenberg, it is apparent that Boettger's material should be labeled Oxapampa, his Huancabamba being far less widely known than the much larger town of the same name. The species affected are:—*Anolis boettgeri*, *Stenocercus boettgeri*, *Prionodactylus spinalis* (Ann. mag. nat. hist., 1911, ser. 8, 7, p. 19–24); *Hyla melanopleura*, *Edalorhina nasuta* (Loc. cit., 1912, ser. 8, 12, p. 185–190); *Leptognathus polylepis*, *Lachesis chloromelas* (Loc. cit., 1912, ser. 8, 10, p. 422–424); and *Hylella ocellata* (Loc. cit., 1918, ser. 9, 2, p. 433). Tabacónas lies in a little valley between the ranges of the cordillera in the northern part of Cajamarca and is in the only strip of rain forest met with during the expedition. Perico, Bellavista, and Chumayo are in the same province in the low, broad and arid valleys of the Chinchipe and Marañon Rivers. Quero-

cotilla is on the border line between Cajamarca and Lambayeque. Like Huancabamba it is a mountain town on the western range of the Andes.

In the preparation of this paper we are greatly indebted, especially in our study of the genera *Phyllobates* and *Telmatobius*, to Dr. Leonhard Stejneger for the loan of a number of specimens; to Mr. H. W. Fowler for a similar loan of Cope's types of *Telmatobius angustipes*, *T. pustulosus*, and *T. aemericus*; to Dr. G. A. Boulenger for his unpublished notes on *Phyllobates pratti* and to Dr. Louis Roule for a sketch of the pectoral girdle of *P. bicolor*.

RANIDAE.

PHYLLOBATES SYLVATICA, sp. nov.

Diagnosis. Closely related to *P. latinasus* (Cope) from which it may be distinguished by the following characters:—

Tympanum about one third instead of one half the diameter of the eye. First finger a trifle shorter instead of a little longer than the second. Tibiotarsal articulation reaching to the middle of the eye, the anterior corner of the eye, or slightly beyond instead of barely reaching the eye. Upper lip broadly edged with white, posterior face of femur black reticulated with white, chest and throat of young specimens washed with grey which may persist in the adult;—instead of upper lip narrowly edged with white, posterior face of femur divided by a yellow line, ventral surface immaculate in both young and adult.

Range. The wet, forested subtropical highlands ("montaña") from Tabacónas to Charápe in northwestern Peru.

Type. M. C. Z. 5,344 from stream-bed at Tabacónas (near Huancabamba) northwestern Peru; 1 September, 1916, G. K. Noble.

Description of Type. Snout moderately prominent, as long as the diameter of the orbit; loreal region vertical; nostril nearer the tip of the snout than the eye; interorbital space a little broader than upper eyelid; tympanum half concealed by a glandular fold, about one third the diameter of the eye; discs well developed, smaller than tympanum; two small metatarsal tubercles, inner oval, outer rounded; a small oblique ridge in the middle of the inner side of the tarsus; tibiotarsal articulation reaching to the middle of the eye. Skin smooth, glandular on the sides.

Uniform dark brown above; a black stripe extending entirely around the body; the upper edge of this stripe, in the body region, bordered with yellow

and the lower edge reticulated with white. Upper lip and lower part of the face, from a line connecting the nostril and tympanum, fleshy white; limbs pale brown blotched with dark brown; hinder sides of thighs reticulated with white; lower parts and ventral surface of body pinkish white, immaculate.

Dimensions.

Distance from snout to vent.....	33 mm.
Greatest width of head.....	11 "
Distance from axilla to tip of longest digit.....	19 "
Distance from groin to tip of longest toe.....	46 "

Notes on Paratypes. The twelve other specimens of the series range in size from fifteen to thirty-two millimeters (snout to vent). One specimen still possesses a large part of the tail. The small specimens are very different in coloration from the adult. Instead of the ventral surface being immaculate there is present a heavy wash of grey extending completely over the throat, chest, and anterior part of the abdomen. In most of the small specimens this grey wash is finely spotted with white. The young of *P. latinasus* do not have the grey wash. At least they are not so recorded. One specimen (M. C. Z. 2,899) of *P. latinasus* from Chimbo, Ecuador is of nearly the same size as two of our small specimens and yet there is no trace of the grey wash. In two of the large paratypes of *P. sylvatica*, both males, this wash is present but only faintly indicated, while it is entirely absent in all of the adult females.

There are only two adult males in the collection. These differ from all the other specimens in being weakly tubercular above. Apparently in this species as in *Bufo marinus* — to a greater extent — rugosity is a secondary sexual character. It has been shown that the males of certain other species of *Phyllobates* transport the larvae on their back. Two tadpoles of this species were taken in a small pond. These do not differ materially except in size from the tadpoles of the tadpole-carrying-species, *P. subpunctatus* (cf. Ruthven and Gaige, Occas. papers, Univ. Mich., 1915, no. 10). Still in the two tadpoles of *P. sylvatica* the second row of teeth is divided by a much shorter interspace than in the tadpoles of *P. subpunctatus*. If the male of *P. sylvatica* does carry its larvae, it is possible that the rugosity may help the tadpoles to maintain their hold.

Besides the presence or absence of the ventral wash of grey, there are other variations in the adults. The dorsal surface may be brown,

spotted with black. In that case the lateral yellowish stripe is very wide, and the dark cross-bars on the thighs are in sharp contrast to the greyish ground-tones. Most of the adults have some dark spots on the back, and most have the dark lateral band profusely reticulated with white.

PHYLLOBATES INFRAGUTTATUS Boulenger.

Nearly a thousand specimens from several localities:—Palambla and Huancabamba (August), Perico and Bellavista (September), and Querocotilla (October).

We have not been able to find any character with which to distinguish the specimens from Palambla, Huancabamba and Querocotilla from a specimen (M. C. Z. 3,214) of *P. infraguttatus* taken at Rio Chanchan, Ecuador. The majority of our specimens from the mountains of northern Peru are dark grey below spotted with white, similar to the Ecuadorian specimen of *P. infraguttatus* before us, but a few of those from the mountains and all of those from the lowlands (Perico and Bellavista) have the ventral surfaces white with a pair of large dark spots just anterior to the pectoral girdle and sometimes a delicate marbling of the same tone along the sides of the belly. The pair of dark spots is scarcely visible in the dark belled specimens from the mountains and no such spots are mentioned in Boulenger's description of *P. infraguttatus*. Nevertheless they are apparently invariably present in some degree and form the most important distinguishing character of the species.

Peracca (Boll. Mus. Torino, 1904, 19, no. 465, p. 17) has shown that Phyllodromus must be referred to Prostherapis, a genus indistinguishable from Phyllobates as defined by Boulenger (Proc. Zool. soc. London, 1888, p. 206). The notch on the posterior margin of the tongue is extremely variable in all the species of Phyllobates and Prostherapis which we have examined. In *Phyllobates trinitatus* the tongue is often entire, while in our huge series of *P. infraguttatus* the tongue is sometimes emarginate and sometimes entire. In the four specimens of *P. latinasus* before us the notch shows various degrees of development. We have examined specimens of *Prostherapis inguinalis* and *P. boulengeri* having an emarginate tongue. It is evident then that the emarginate tongue does not distinguish Phyllobates from Prostherapis.

In internal structure Prostherapis agrees essentially with Phyllo-

bates. The type of the latter genus, *P. bicolor*,¹ is known only from the type-specimen. This is at present in the Museum d'Histoire Naturelle in Paris, and thanks to the kindness of Dr. Louis Roule we are able to make some statement as to its internal structure. Its pectoral girdle is similar to that of *Phyllobates trinitatus*, *P. pratti*, *P. infraguttatus*, *Prostherapis inguinalis*, and *P. boulengeri*. The girdle-form of *P. trinitatus* Garman (Fig. 1) may be taken as characteristic

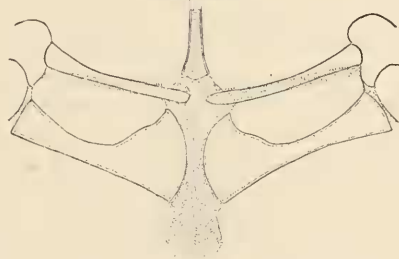


FIG. 1.—*Phyllobates trinitatus* Garman. Shoulder-girdle. x 18.

of all these species. In the sketch of the girdle of *P. bicolor* sent us by Dr. Roule, the anterior part of the omosternum is not represented. It may have been lost during dissection. The fact that the form of the coracoids and metasternum agrees in all the species examined is excellent indication of the species close affinity. We can see no reason for maintaining *Prostherapis* distinct from *Phyllobates*.

There remains another genus which should be referred to the synonymy of *Phyllobates*. *Colostethus*, known only from the type-specimen of *C. latinasus*, was described by Cope as lacking the omosternum. The type-specimen cannot be found in either the U. S. National Museum or the Academy of Natural Sciences of Philadelphia. Specimens very similar to *C. latinasus*, but possessing an omosternum, have been found in Ecuador and Colombia. Boulenger has recently advised the senior author by letter that he considers his *Phyllobates pratti* referable to *C. latinasus*. Boulenger evidently considers that Cope overlooked the omosternum, a very probable oversight, in view

¹ The locality of this species has been discussed by the senior author (Mem. M. C. Z., 1919, 47, p. 113).

of the smallness of the type-specimen. Since the type of *C. latinasus* is most probably lost, we consider it advisable to follow Boulenger's suggestion and to place *Colostethus* in the synonymy of *Phyllobates*.

The number of species of *Phyllobates* is greatly increased by the referring of *Phylldremus*, *Prostherapis*, and *Colostethus* to its synonymy. It is highly probable that some of the species are not actually distinct from others. The name *P. pulchellus* is based upon a figure only (Espada, *Vertebrados del Viaje al Pacifico*, Batracios, 1875, pl. 3, fig. 3, 3a, 3b, and 3c) of a frog, without data. Unfortunately the figures do not show the ventral surface. Seven species of *Phyllobates* are described with a dorsal pattern very similar to that represented as *P. pulchellus*. These seven species are most readily distinguishable by their ventral coloration. Any one of them may be referable to *P. pulchellus* but without a description of their ventral surfaces it is impossible to say which of them should bear the name. Our specimens of *P. infraguttatus* are very similar to Espada's figure. Moreover, we have recently examined some specimens (U. S. N. M. 61,763, 61,764) of the same species from Huigra, Ecuador. These offer further evidence of the wide distribution of the species in Ecuador and northern Peru. It is probable that Espada's type of *P. pulchellus* came from Ecuador. But until this type-specimen can be examined and sufficiently characterized we have no right to refer Boulenger's *P. infraguttatus* to that species. The name *P. pulchellus* must be dropped until the type-specimen can be examined.

We have remarked about the similarity of color-pattern in several species of *Phyllobates*. The dorsal color-pattern shows little variation in our enormous series of *P. infraguttatus*. The ground-tone may be light or dark grey. The pale specimens, mostly from the lowlands, have the dorsal spotting very distinct and in sharp contrast to the light grey ground-tone. Dark specimens are uniform above, the spots being concealed by the ground-tone. The characteristic pair of spots on the chest are indistinct in the darkest and practically wanting in the very lightest specimens of the series.

At Querocotilla one specimen was found which appeared nearly a uniform pea-green. The specimen was put in a jar of fixing fluid (.5% formol) and in the course of half an hour the green tones were replaced by greys and the ordinary pattern appeared making the specimen indistinguishable from the others.

The species of *Phyllobates* are all small, and possess few features by which they may be distinguished from one another. Still it has been considered advisable to attempt a key, unfortunately based

largely upon the published descriptions. In the preparation of this key certain species have been found to be certainly synonymous with others. *Prostherapis equatorialis* Barbour is referable to *Eleuthero-dactylus unistrigatus* (Günther), *Prostherapis herminae* Boettger to *Phyllobates trinitatus* Garman, *Prostherapis variabilis* Werner to *Phyllobates subpunctatus* Cope, and *Phyllobates* (*Hypodictyon*) *palmatus* Werner to *Syrrhophus palmatus* Werner.

Key.

- A. Flash colors of red or yellow on the axilla and inguinal or femoral regions; dorsal surface of head and body distinctly glandular.
 - B. First finger longer than second.
 - C. Flash colors yellow.....*femorialis* (Boulenger).
 - CC. Flash colors pink.....*inguinalis* (Cope).
 - BB. First finger not extending beyond second.
 - C. Ground-tone of back lemon-yellow.....*tricolor* (Boulenger).
 - CC. Ground-tone of back brownish grey.....*festae* (Peracca).
 - AA. No flash colors; dorsal surface of head and body not distinctly glandular although sometimes tubercular.
 - B. Lower surfaces of adult white, immaculate.
 - C. Tibiotarsal articulation not reaching beyond tympanum.
vertebralis (Boulenger).
 - CC. Tibiotarsal articulation reaching to eye.
 - D. Skin with numerous low, glandular warts, tympanum concealed.
brunneus (Cope).
 - DD. Skin smooth or with scattered tubercles, tympanum indistinct.
 - E. Tympanum one half diameter of eye; tibiotarsal articulation reaching barely to eye.....*latinasus* (Cope).
 - EE. Tympanum one third diameter of eye; tibiotarsal articulation reaching to middle of eye or beyond.
sylvatica Barbour & Noble.
 - BB. Ventral surface of adult brown or spotted with dark tones.
 - C. A dark bar, two dark spots or a dark wash spotted with white on the chest.
 - D. A dark bar across the chest, anterior part of belly generally of same dark tone.....*trinitatus* Garman.
 - DD. No dark bar across chest.
 - E. Throat and breast mottled with greyish brown.
kingsburyi Boulenger.
 - EE. Ventral surface dark, spotted with white, sometimes only two greyish spots on chest.
 - F. Black above, spotted with white on sides.
alboguttatus Boulenger.

- FF. Greyish above, no spots on sides, generally a longitudinal stripe on each side.....*infraguttatus* Boulenger.
- CC. No dark bar or spots on chest.
- D. Ground-tone of ventral surface uniform blackish.
melanorhinus Berthold.
- DD. Ground-tone of ventral surface greyish or whitish.
- E. Tympanum concealed, throat greyish, belly white.
trilineatus Boulenger.
- EE. Tympanum not concealed.
- F. Tympanum two thirds diameter of eye.
- G. Two white lines on each side of head.
bolivianus (Boulenger).
- GG. No white lines on head.....*whymperi* (Boulenger).
- FF. Tympanum about half the diameter of eye, or less, sometimes indistinct.
- G. First finger longer than second; tympanum hidden or about one third diameter of eye....*boulengeri* (Barbour).
- GG. First two fingers of equal length; tympanum about half as broad as eye.....*subpunctatus* (Cope).

One species, generally referred to *Phyllobates*, differs radically from all the species of that genus and must be considered generically distinct. We propose for it the name:

SMINTHILLUS, gen. nov.

Type. *Sminthillus limbatus* (Cope).

Diagnosis. Habit of *Phyllobates* but no pair of dermal scales on the upper surface of the digital discs; coracoids narrow (Fig. 2);

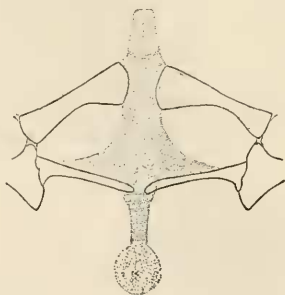


FIG. 2.—*Sminthillus limbatus* (Cope). Shoulder-girdle. x 27.

precoracoid cartilages very broad, merging gradually into the broad epicoracoid cartilage; omosternum cartilaginous, without a bony

sheath in the adult; sacral diapophysis slightly dilated; no vomerine teeth; tongue elliptic, narrow and free behind; pupil horizontal; tympanum distinct; toes free; terminal phalanges T-shaped.

LEPTODACTYLIDAE.

ELEUTHERODACTYLUS LYMANI,¹ sp. nov.

Diagnosis. Similar to *E. conspicillatus* (Günther) in most of its features, but differing from that species in the much shorter toes, especially the fourth toe; in the longer first finger and in the somewhat different color-pattern. Young specimens are similar in habit to that species but adult specimens are much stouter and with a broader, less acuminate snout.

Range. Hills and valleys of the central Andes of northwestern Peru, from Palambla (near Huancabamba) to Bellavista.

Type. M. C. Z. 5,422 from Perico, valley of the Chinchipe, northwestern Peru; 10 September, 1916, G. K. Noble.

Description of Type. Size large, head broader than body, exactly as long as broad; snout subacuminate with distinct *canthus rostralis* and concave loreal region; orbital diameter equals the distance between the eye and nostril, twice as great as the distance from nostril to end of snout; interorbital space a trifle broader than the upper eyelid. Tongue oval, slightly nicked behind. Vomerine teeth in two oblique, approximated fasciculi behind the choanae. Tympanum distinct, half the diameter of the eye. Fingers moderate, the first extending beyond the second; toes short with a rudiment of a web; discs small, not much wider than the middle part of the toes; subarticular tubercles well developed; a round outer and an elongate inner metatarsal tubercle, both very distinct. Tibiotarsal articulation reaches just to the tip of the snout. Skin finely granular on the back, nearly smooth on the head, and coarsely granular on the lower surfaces of the thighs; no glandular dorsolateral fold.

Ground-color above, ashy grey fading to yellowish grey on the sides. Two chevron-shaped bands of dark brown on the back, one over the scapulae and one just before the ilia; two or three spots of the same color posterior to the ilia. A narrow stripe of dark brown along the *canthus rostralis* and over the tympanum; a faint interorbital bar. Lips and appendages cross-barred with dark brown; four bars across the legs; posterior surfaces of thigh reticulated with dark brown and white. Ventral surface of head and body white, unspotted; of feet a dark brown.

¹ Named in honor of Prof. Theodore Lyman whose generosity enabled the Museum of Comparative Zoölogy to send a zoölogist with the Harvard Peruvian expedition of 1916.

Dimensions.

Distance from snout to vent.....	52 mm.
Greatest width of head.....	21 "
Distance from axilla to tip of longest finger.....	29 "
Distance from groin to tip of largest toe.....	89 "

Notes on Paratypes. The twenty-nine specimens in the series show considerable diversity in color. The ground-tone varies from a yellow or a dull pink to a very dark brown. The specimens vary in length from 23 to 58 millimeters (snout to vent). Most of the small specimens have a very distinct pattern with a dark interorbital bar and two spots anterior to it. Two small specimens have a light vertebral line. The pattern does not appear in a few of the specimens. Very dark specimens have the throat stippled with brown.

ELEUTHERODACTYLUS CAJAMARCENSIS, sp. nov.

Diagnosis. Related to the Borborocoetes group of *Eleutherodactylus*, e. g. *E. whymperi*, *E. unistrigatus* etc.; probably most closely related to *E. riveti* (Despax); distinguished from the latter species by the following characters: — tympanum distinct slightly less than half the diameter of the eye; first toe shorter than the second; skin smooth on the snout, slightly granular on the eyelids and back, the granules tending to form a series of longitudinal rows; coloration nearly uniform yellowish grey; a few dark lines forming a weak pattern; ventral surface immaculate.

Range. Only known from the type-specimen.

Type. Sexually mature male, M. C. Z. 5,407 from the Pre-Incan ruins near Huambos, Cajamarca, northwestern Peru; 10 October, 1916, G. K. Noble.

Description of Type. Size small, body depressed; head broad, Hyla-like; head about as broad as the body; broader than long; snout blunt with very distinct *canthus rostralis*; orbital diameter much greater than the distance between eye and the nostril; the latter situated very near the end of the snout; interorbital space a little broader than upper eyelid. Vomerine teeth barely distinct, in two obliquely directed groups, extending backward from the inner, posterior margins of the choanae. Tympanum distinct, slightly less than half the diameter of the eye. Fingers stout, the second extending beyond the first; toes short, a vestige of a web between the outer three; discs distinct, those of the toes larger than those of the fingers; subarticular tubercles well de-

veloped, a round outer and a very elongate inner metatarsal tubercle, both very distinct. Tibiotarsal articulation reaching only to the tympanum. Skin smooth on the snout, slightly granular on the eyelids and back, the granules on the back tending to form a series of indistinct longitudinal rows; sides of the body warty; ventral surface strongly granular.

Coloration in alcohol nearly uniform yellowish grey; a dark canthal stripe fading out behind the tympanum; a number of indistinct brownish bands extending along the back; three oblique bands across the legs, these tending to form continuous lines when the leg is half extended; ventral surface uniform yellowish grey, much yellower than the dorsal surface. In life the ground-tone was yellowish pink and the dark pattern was fairly distinct.

Dimensions.

Distance from snout to vent.....	19	mm.
Greatest width of head.....	7.5	"
Distance from axilla to tip of longest digit.....	12	"
Distance from groin to tip of longest toe.....	26.5	"

LEPTODACTYLUS CURTUS, sp. nov.

Diagnosis. A short-legged species having no fringes on the toes, apparently related to *L. bufonius* Boulenger; head short, the profile chisel-shaped; tympanum half the diameter of the eye; no distinct dorsolateral fold; back and sides with a few low warts.

Range. Valleys of the Chinchipe and Mara on Rivers between Perico and Bellavista, northwestern Peru.

Type. M. C. Z. 5,281 from Bellavista, Cajamarca, Peru; 28 September, 1916, G. K. Noble.

Description of Type. Size moderate; head about as wide as the body, just as long as broad; snout very acuminate without *canthus rostralis*, but with a slight depression in the loreal region; profile of snout a very acute angle, the anterior corner of the eye, the nostril and the tip of the snout being in the same plane; orbital diameter slightly greater than the distance between eye and nostril, slightly less than the distance between nostril and end of the snout; interorbital space about one half as broad as the upper eyelid. Tongue oval, slightly nicked behind. Vomerine teeth in two well-arched series behind the choanae. Tympanum one half the diameter of the orbit. First finger much longer than the second; toes short, not fringed; subarticular tubercles well developed; the inner metatarsal tubercle very large, the outer barely visible;

a distinct tarsal fold. Tibiotarsal articulation reaches to the tympanum. Skin glandular but not tubercular; a few flat warts on the back and sides; these tend to form a weak dorsolateral fold; a large ovoid gland situated at each corner of the mouth, its posterior end directed downward; a large inguinal gland on each side of the body; a small but distinct glandular wart on the posterior face of each femur.

Ground-tone of dorsal surface olive-grey; a number of dark brown spots forming a pattern; an hour-glass-shaped figure between the eyes and pectoral region; the anterior end of the figure much wider than the posterior, and outlined with pale grey; the posterior end of the figure continuous with two rows of dark spots which extend the length of the back; a series of dark spots along the side of the head and body; these tend to form a line along the indistinct dorsolateral fold; two or three spots on the lips; the legs irregularly cross-barred; the posterior surfaces of the thighs reticulated with black and white; ventral surface whitish, immaculate.

Dimensions.

Distance from snout to vent.....	49 mm.
Greatest width of the head.....	19 "
Distance from axilla to tip of longest digit.....	26 "
Distance from groin to tip of longest toe.....	66 "

Notes on Paratypes. The series of twenty-two specimens shows a great uniformity in the proportions of the body. The color-pattern is subject to some variation. This consists chiefly in a multiplication of the dark spots, and in a fading or intensifying of the ground-tone. Very dark specimens have the periphery of the ventral surface stippled with dark brown.

Remarks. A study of a series of *Leptodactylus albilabris* from St. Croix has led to the conclusion that the chisel-shaped head form of *L. curtus* may be only a somatic variation. All of the specimens in our series of the latter species (these measuring in length, snout to vent, from forty to fifty-eight millimeters) have exactly the same head-form regardless of sex. It has been suggested (Barbour, Proc. Biol. soc. Wash., 1917, 30, p. 103) that this head-form might be a nuptial modification; it does not seem that it is a secondary sexual character, at least not in the case of *L. curtus*. In our specimens even the youngest are hardly sexually mature. Since these were all taken around sandy sloughs, it is possible that the head-form may be a modification for burrowing in the sand. Direct field observation is lacking on this point.

TELMATOBIUS Wiegmann.

The status of the genus *Telmatobius* has not been understood. Its true relations cannot be determined until the internal structure of the type, *T. peruvianus*, has been described and the statements of Cope (Bull. 34, U. S. N. M., 1889, p. 312) confirmed. For the present we refer his genus *Cophaeus* to the synonymy of *Telmatobius*.

Telmatobius has been confused also with *Cycloramphus*. Specimens of that genus are not available for study but judging from the published descriptions the genus is a well-defined one. It is distinguished from *Telmatobius* by the presence of stout vomerine teeth arranged in two long rows behind, not between, the choanae. Inguinal glands are present in three of the four described species but are not mentioned in *C. brasiliensis* (Steindachner). In *Telmatobius* not a single species is so provided. The males of the latter genus, unlike the former, are provided during the breeding season with dense asperities on the chest, forearm, and thumb. Boulenger (Cat. Batr. Sal. Brit. Mus., 1882, p. 184) distinguishes *Cycloramphus* from *Telmatobius* by its separated outer metatarsals. This character is not mentioned in several of the descriptions, and until specimens can be examined it seems advisable to use the teeth characters as distinguishing *Cycloramphus* from *Telmatobius*. In doing this we find that we have two natural assemblages, *Telmatobius* confined to the Andes and Bolivian Chaco and *Cycloramphus* to the highlands of Brazil. After referring *Telmatobius brasiliensis* Steindachner and *T. duseni* Andersson to *Cycloramphus*, and upon placing *T. asper* Boulenger in the synonymy of *C. asper* Werner we have four species of *Cycloramphus* which may be separated by the following

Key.

- A. Toes less than half webbed.....*duseni* (Andersson).
- AA. Toes more than half webbed.
 - B. Skin smooth.....*fuliginosus* Tschudi.
 - BB. Skin warty or provided with horny tubercles.
 - C. Skin of the body loose and wrinkled; toes completely webbed.
brasiliensis (Steindachner).
 - CC. Skin of body not loose dorsally; toes not fully webbed.
asper Werner.

The species of *Telmatobius* are so little known that it is advisable to redescribe the type-specimens of several of the species and to append a key of all those considered distinct. In reviewing the species the fact has presented itself very forcibly that *Telmatobius* within itself represents various stages in the reduction of both maxillary and vomerine teeth. This reduction of teeth is associated with aquatic life. In the Lake Titicaca region *T. acmaricus* is found along the edges of the small streams and ponds, while *T. culcus* occurs only in the deep waters of Lake Titicaca where according to Garman (Bull. M. C. Z., 1875, 3, p. 277) it is able to remain for hours without coming up to breathe. Garman (*Loc. cit.*) says "As might be expected from the exclusively aquatic habits of *culcus*, its skeleton is weaker and less perfectly ossified than that of *marmoratus* [= our *acmaricus*]. In the latter the skull and its processes are strong and the foramina and fontanel very small."

Garman pointed out that the vomerine teeth were very reduced, sometimes absent on one side or the other. We have found that the maxillary teeth of *T. culcus* are also much reduced in size.

As association exactly similar to that of *T. culcus* and *T. acmaricus* is found in the Lake Junin region where *T. jelskii* is the semiaquatic and *Batrachophrynus microphthalmus* the lake-form. The latter species although currently placed in a different genus and family from *T. culcus* agrees entirely with it in most of its internal and external characters. Peters (Monatsber. Akad. wiss. Berlin, 1873, p. 413) and Werner (Abh. Zool.-anthro. mus. Dresden, 1901, 9, no. 2, p. 13, fig.) have shown that *Batrachophrynus* is a *Telmatobius* in every particular except that it lacks the maxillary and vomerine teeth. A comparison of *Batrachophrynus* with *T. culcus* suggests that this difference is not fundamental or of any real significance.

In the appended descriptions we have included Philippi's *T. montanus* and *T. lacvis*. We are strongly inclined to follow Boulenger's suggestion (Zool. record. Rept., 1902, p. 14) and disregard these names as well as those of the other utterly unrecognizable species which he has proposed (Supplementa a los Batraquios Chilenos descritos en la Historia fisica y politica de Chile de don Claudio Gay. Santiago, 1902). Nevertheless it seems highly probable that Philippi had some species of *Telmatobius* before him when he wrote his paper, so for the present it may be better to consider his proposed species valid.

Andersson's record (Ark. zool., 1906, 3, no. 12, p. 4) of *T. jelskii* from the Andes of western Argentina and Werner's report (Zool.

jahrb. Suppl., 1897, 4, p. 263) of *T. aemericus* and *T. marmoratus* in Chile certainly require confirmation. The status of the genus in Chile is not at all clear.

Key.

- A. Skin warty, at least provided with strong tubercles.
 - B. Vomerine teeth in two small groups.
 - C. Tibiotarsal articulation reaching the tip of the snout; color above brownish grey spotted with dark brown....*verrucosus* Werner.
 - CC. Tibiotarsal articulation reaching the angle of the mouth; color above uniform blue-gray.....*hauthali* Koslowsky.
 - BB. Vomerine teeth absent or barely visible.
 - C. Entire upperside of legs provided with tubercles, a distinct color-pattern.....*peruvianus* Wiegmann.
 - CC. Tubercles on the legs restricted to the dorsal side of the tibia, no distinct color-pattern.....*pustulosus* (Cope).
- AA. Skin smooth or granular.
 - B. A strong supratympanic fold.
 - C. Vomerine teeth prominent, in two large groups.
 - D. Tympanum hidden.....*niger* Barbour & Noble.
 - DD. Tympanum present.....*ignavus* Barbour & Noble.
 - CC. Vomerine teeth present or absent, generally in two very small groups.
 - D. Skin very loose, large femoral flaps; tibiotarsal articulation reaches only to the corner of the mouth....*cul'eus* (Garman).
 - DD. Skin loose only on the sides.
 - E. Ventral coloration uniform pale below.....*aemericus* (Cope).
 - EE. Ventral coloration sooty grey pale on throat only.
jelskii (Peters).
 - BB. No supratympanic fold.
 - C. Vomerine teeth absent.
 - D. Toes fully webbed.....*montanus* Philippi.
 - DD. Toes one quarter webbed.....*laevis* Philippi.
 - CC. Vomerine teeth present.
 - D. Tibiotarsal articulation not reaching the eye; color above brown mottled with black.....*marmoratus* (Duméril & Bibron).
 - DD. Tibiotarsal articulation extending to the anterior edge of the eye; color uniform brown above.....*angustipes* (Cope).

TELMATOBIUS VERRUCOSUS Werner.

Telmatobius verrucosus Werner, Zool. anz., 1899, 22, p. 482.

Diagnosis (extracted from original description). Vomerine teeth in two round groups between the choanae. Tympanum hidden. Toes webbed to the

basis of the last phalanges, only in the fourth toe webbed to the base of the next to the last phalange; the free phalanges of the toes with a distinct seam in the skin, especially distinct on the outer edge of the fifth toe. Tibiotarsal articulation reaches the tip of the snout. Upper surface rugose, upper lip, appendages, and under surface smooth. A strong fold from the posterior edge of the eye to the corner of the mouth. Color above brownish grey, spotted with dark brown, the tubercles all dark brown. Ventral surface uniform light greyish brown.

Habitat. "Chaco, Bolivia." The species is known only from the original description.

TELMATOBIOUS HAUTHALI Koslowsky.

Telmatobius hauthali Koslowsky, Revista Mus. La Plata, 1895, 6, p. 359, pl. 1.
(?) *Telmatobius jelskii* Andersson, Arkiv. zool., 1906, 3, no. 12, p. 4.

Diagnosis (extracted from original description). Vomerine teeth in two small groups between the cheanae. Toes more than half webbed, a free border extending along the interior edge of the tarsus, and on the outer side of the interior toe. The leg extended forward reaching with the tibiotarsal articulation the angle of the mouth. Skin smooth, covered with numerous horny tubercles on the chest, back, abdomen, and appendages. Lead color or blue-grey above, darker on the head region; ventral surface dirty yellowish white; some specimens mottled with dark tone on the posterior part of the ventral surface, all specimens uniform above.

Habitat. The type-locality: Andes of Catamarca, Argentina, Aguas Calientes, a streamlet 4,060 meters above sea-level.

Remarks. Oddly enough this species has been found only in the warm waters of a hot spring. In the type description Koslowsky (1895, p. 360) says:—"Señor Rodolfo Hauthal los tomó en el arroyo, cuyas aguas siempre conservan una temperatura de veinte grados, Celsius." How different from the frigid waters of Lake Titicaca, the home of the closely related *T. culcus*!

TELMATOBIOUS PERUVIANUS Wiegmann.

Telmatobius peruvianus Wiegmann, Nova acta, 1835, p. 262, pl. 22, fig. 2.

Telmatobius peruvianus Boulenger, Cat. Batr. Sal. Brit. mus., 1882, p. 191.

Diagnosis (extracted from the original description). Presence of vomerine teeth questionable. Toes with short webs. Skin finely granular, covered

upon the head, the whole back and the upper surface of the legs with many small flattened tubercles, each of which is provided with a hard, horny point, dark in color. Skin of under surface smooth except for the characteristic horny tubercles in the pectoral region characteristic of the male *Telmatobius*, in the breeding season. Color above brown, a darker band extending from the snout to the foreback forming with two cross-bands drawn from the ear to the shoulder region a feeble double cross; under surface of the body and legs a brown-yellow.

Habitat. Cordillera de Guatilla, near the town of Palca, two days' journey east of Tacna, Chile (Meyen).

Remarks. It is highly probable that *T. peruvianus* is a land-frog with habits similar to those of *T. acmaricus*, for Meyen says in his account of finding the type: —

“Unser Nachtlager schlügen wir einer natürlichen Höhle des dicht daneben anstehenden Gesteines auf;...gegen Abend liess sich das Quaken eines Frosches hören.” (Reise um die Erde, 1834, p. 450).

TELMATOBIUS PUSTULOSUS (Cope).

Cyclorhamphus pustulosus Cope, Proc. Amer. philos. soc., 1877, **17**, p. 39.

Telmatobius pustulosus Boulenger, Cat. Batr. Sal. Brit. mus., 1882, p. 192.

Diagnosis. A rather large species, the skin not especially loose but with tubercles present on sides, belly, lower side of forearm, vent region, and lower back and upper surface of tibia and sole of foot; vomerine teeth barely visible; no distinct color-pattern.

Habitat. This was another of Professor Orton's discoveries during his exploration of the Peruvian Andes. He secured the type and only specimen known or recorded, at Tinta, a small town at an elevation of 11,400 feet in the Department of Cuzco, Southern Peru.

Type. Acad. nat. sci. Phil., 11,401; Tinta, Peru; altitude 11,400 ft.

Description of Type. Size moderate; head broader than long, much broader than body, its length contained in the total length of body 3.2 times; snout rounded with no distinct *canthus rostralis*; nostrils although at the end of the superior plane of the muzzle, equidistant between the orbit and the labial border. Vomerine teeth barely visible, in two very small groups between the choanae which are much enlarged; tongue small, nearly round. Interorbital space 1.2 as broad as the length of the eye; the length of the snout 1.4 as long as the length of the eye; tympanum concealed by the skin, but on one side

indicated by a vertical oval, the greatest diameter of which is one half the length of the eye. Digits free, slender, without discs; the first and second fingers equal in length and shorter than the fourth; the elbow extended forward reaches a little beyond the orbit. Toes slender, without discs, less than



FIG. 3.—*Telmatobius pustulosus* (Cope). 1. Foot. 2. Hand. 3. Open mouth.

half webbed; subarticular tubercles only moderately developed; a distinct inner metatarsal tubercle but no outer; heels barely in contact when the hind limbs are folded at right angles to the axis of the body; the tibiotalar articulation reaches the anterior edge of the orbit when the hind limbs are carried forward along the body. Skin smooth except for the low tubercles on the sides of the body, underside of forearms, posterior dorsal surface of body, region around the vent, dorsal side of the tibia, and ventral side of the foot; the tubercles on the sides of the body much larger than the others, and more whitish in color. No glandular folds on the dorsal surface, a few longitudinal creases on the ventral surface.

Color above brown with a few indistinct darker markings; light brown below, gular region and lateral tubercles milky white.

Dimensions.

Tip of snout to vent.....	58.5 mm.
Tip of snout to posterior end of mandibular bone.....	21 "
Greatest width of head.....	22 "
Fore leg to tip of longest finger.....	36 "
Hind leg to tip of longest toe.....	85.5 "

TELMATOBIUS NIGER, sp. nov.

Diagnosis. A medium-sized frog, with finely granular skin; a strongly developed supratympanic fold, the vomerine teeth well developed in two large prominent groups and with the tympanum hidden.

Habitat. Many years ago a series of seven or eight of these frogs were given the senior author by Mr. R. L. Ditmars, to whom they were presented by a mining or railway engineer who had been to Ecuador probably working on the Quito-Guayaquil Railroad at that time under construction. They bore a label "Palmira Desert, Ecuador, 10,500 feet altitude." It has been impossible to identify this locality with absolute certainty, but the Palmira is very probably the one referred to as the hacienda de Palmira in the Andes of southern Ecuador by Theodoro Wolf in his *Geografia y Geologia del Ecuador* (Leipzig, 1892, p. 35). The village of the hacienda is a few miles south of Vilecabamba in the Province of Loja and is said to have an altitude of 1,748 meters. This is but half the altitude given on our label. There may be another Palmira or the "desert" may in reality be a Paramo, of the same name as the hacienda, not far away in the highlands south of Loja.

Type. M. C. Z. 3,037 from Palmira Desert, Ecuador. Coll. Thomas Barbour, 1909.

Description of Type. Size moderate; head broader than long, about equal to the width of the body, its length contained in the total body length 3.3 times; snout very short and high without *canthus rostralis*, nostril nearer the orbit than the labial border. Vomerine teeth prominent in two well-defined groups between the choanae which are of moderate size; tongue longer than broad. Interorbital space 1.3 as broad as the length of the eye; the length of the snout 1.4 times that of the eye; tympanum hidden, the region partly covered by the supratympanic fold. Digits free, stout, slightly dilated at the tips, the first finger longer than the second but shorter than the fourth; the elbow extended forward reaches nearly to the eye. Toes fully webbed, the webs notched making the toes appear only slightly more than half webbed; a distinct tarsal fold; subarticular tubercles well developed; the inner metatarsal tubercle much larger and more prominent than outer; heels not in contact when the hind limbs are folded at right angles to the axis of the body; the tibiotarsal articulation reaches to the middle of the eye when the hind limb is carried forward along the body. Skin very glandular above, the glands being so small that the skin appears granular and not warty; a loose, baggy, lateral fold on each side, the fold beginning at the posterior angle of the eye and con-

tinuing to the groin; in the supratympanic region this fold somewhat swollen resembling on one side a parotid gland; skin on the sides of the body loose and folded; ventral disc marked off by a transverse fold between the fore limbs

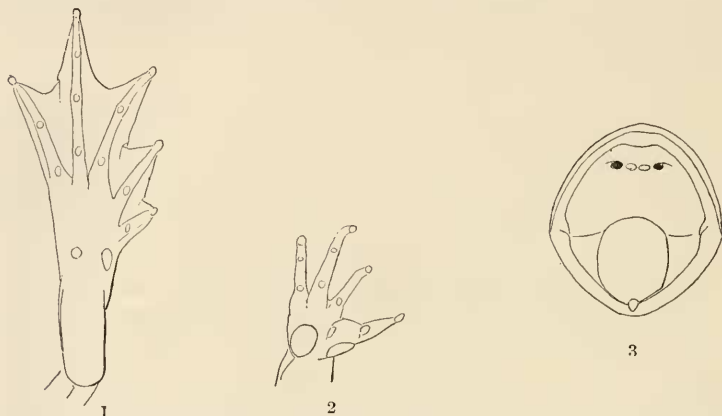


FIG. 4.—*Telmatobius niger* Barbour & Noble. 1. Foot. 2. Hand. 3. Open mouth.

and by two longitudinal creases, one on either side of the belly; skin on the thighs loose, but no posterior flap.

Color above very dark chestnut-brown; ventral surface yellow, heavily mottled and spotted with dark brown; the spots most abundant on the throat, east so upon the thighs; tips of fingers and toes yellow.

Dimensions.

Tip of snout to vent.....	61 mm.
Tip of snout to angle of jaw.....	21 "
Greatest width of head.....	22 "
Fore leg to tip of longest finger.....	37 "
Hind leg to tip of longest toe.....	91 "

Remarks. The only specimens known are the typical series some of which have been distributed under the name of *Telmatobius jelskii* to the U. S. N. M. and possibly elsewhere. Until topotypes of *jelskii* were secured recently, we had these two species confused.

TELMATOBIUS IGNAVUS, sp. nov.

Diagnosis. A medium-sized smooth-skinned frog with strongly developed supratympanic fold, the vomerine teeth well developed in two large prominent groups and with the tympanum exposed.

Habitat. Central Cordillera of Piura, northern Peru. It may perhaps also be expected to occur in the higher portions of Cajamarca and Lambayeque.

Type. M. C. Z. 4,093 within the town limits of Huancabamba, Piura, Peru; 5 August, 1916, G. K. Noble.

Description of Type. Size moderate; head broader than long, much narrower than the body, its length contained in the total length of the body just three times; snout rounded and flat without *canthus rostralis*, nostril slightly nearer the orbit than the labial border. Vomerine teeth in two large groups between the choanae which are very small; tongue moderate in size, longer than broad. Interorbital space 1.4 as broad as the length of the eye; the length of the snout 1.5 times that of the eye; tympanum one fourth the diameter of the eye, partly covered by the supratympanic fold. Digits free, stout, slightly dilated at the tips, the first finger longer than the second but shorter than the fourth; the elbow extended forward reaches slightly beyond the

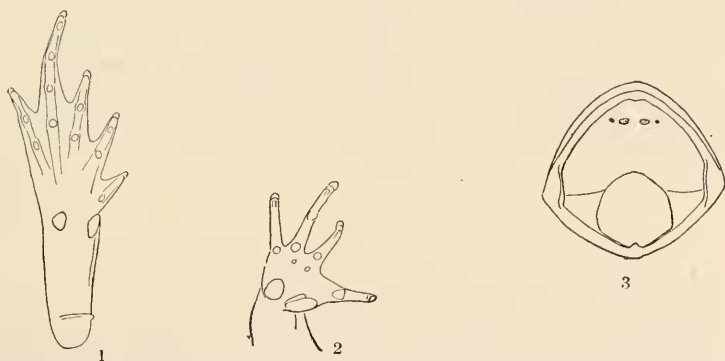


FIG. 5.—*Telmatobius ignavus* Barbour & Noble. 1. Foot. 2. Hand. 3. Open mouth.

tympanum. Toes more than half webbed, but the webs notched, making the toes appear only one third webbed; a narrow border of free skin on the inner side of the tarsus; subarticular tubercles distinct; the inner and outer metatarsal tubercles well developed; heels just in contact when the hind limbs are folded at right angles to the axis of the body; the tibiotarsal articulation reaches nearly to the posterior edge of the orbit when the hind limbs are carried forward along the body. Skin smooth; upper surface of body, and appendages somewhat glandular, the glands appearing as irregular patches of pores; a well-developed lateral fold, beginning at the posterior angle of the orbit and extending to the groin; skin on the sides of body very loose and baggy; ventral disc marked off by a transverse fold between the fore limbs and two

longitudinal ones on either side of the belly; skin on the thighs somewhat loose, but without posterior flaps.

Color above dark reddish brown faintly marked by large spots of a darker color; ventral surface uniform cream-white mottled on the thighs with brown and pure white.

Dimensions.

Tip of snout to vent.....	54.5 mm.
Tip of snout to posterior end of mandibular bone.....	20 “
Greatest width of head.....	22 “
Fore leg to tip of longest finger.....	32 “
Hind leg to tip of longest toe.....	72 “

Remarks. The type and only specimen secured was taken in a small cistern at the western end of the town of Huancabamba. The junior author was searching for *Gastrotheca* larvae in this cistern, not three feet in diameter, when he suddenly espied this good-sized frog. None of the boys present seemed to know it, for to his urgent “*Como se llama ésta Rana*,” they only shook their index-fingers in that peculiar wagging manner by which the Peruvian “*cholo*” signifies that he does not know. Diligent collecting in the streams about Huancabamba for a month did not reveal another specimen.

TELMATOBIUS CULEUS (Garman).

Cyclorhamphus culeus Garman, Bull. M. C. Z., 1875, 3, p. 276, pl. .

Telmatobius jelskii (?) Boulenger, Cat. Batr. Sal. Brit. mus., 1882, p. 191 (*pars*).

Diagnosis. A very large species, with a smooth loose, baggy skin; vomerine teeth so reduced as to be almost invisible; strong supratympanic, lateral and femoral folds or lappets; the tibiotarsal articulation reaching only the angle of the jaws.

Habitat. Confined to Lake Titicaca where it leads an absolutely aquatic existence.

Type. M. C. Z., 1,077 from bottom of Lake Titicaca, Peru; taken dredging by S. W. Garman, in eleven fathoms off Achacache, Bolivia.

Description of Type. Size very large; length of the head contained in the breadth 1.5 times, in the total length 3.8 times; snout round, very flat without *canthus rostralis*; nostril minute, slightly nearer the orbit than the labial border. Vomerine teeth reduced to a few very small spines which scarcely break through the buccal epithelium at two points between the choanae; the

choanae enlarged and at a slight angle to each other; tongue small, longer than broad. Interorbital space nearly two times as broad as the length of the eye; tympanum hidden, the region covered by two loose flaps of skin. Digits slender but edged on either side by a seam of skin which does not develop into a web, tips not dilated; the first finger a trifle longer than second, equal in length to the fourth; the elbow extended forward reaches only about three



FIG. 6.—*Telmatobius culeus* (Garman). 1. Foot. 2. Hand. 3. Open mouth.

fourths of the distance to the orbit. Toes fully webbed but deeply notched, making them appear slightly more than half webbed; a free border of skin on the inner side of the tarsus and a narrower one on the outer edge of the fourth toe; subarticular tubercles barely visible, the metatarsal tubercles the most distinct; heels almost in contact when the hind limbs are folded at right angles to the axis of the body; the tibiotarsal articulation reaches slightly beyond the angle of the mouth, when the hind limb is carried forward along the body. Skin smooth, the entire upper surface glandular, the glands appearing as numerous small depressions; skin very loose and baggy, falling into a number of large folds and flaps; a supraocular fold continued posteriorly to form a supratympanic and lateral fold, several transverse folds on the sides; a very wide, loose, liquid-filled bag or flap extending along the posterior side of each thigh; many folds on the appendages due to the loose character of the skin.

Color slate-grey above thickly spotted with white; the spots more abundant ventrally giving the under surface a lighter appearance.

Dimensions.

Tip of snout to vent.	97	mm.
Tip of snout to posterior end of mandibular bone.	36	"
Greatest width of head.	43	"
Fore leg to tip of longest finger.	52.5	"
Hind leg to tip of longest toe.	135	"

Remarks. Mention has already been made of the probable evolution of *T. culeus* from *T. acmaricus*. Garman is the only herpetologist who has ever published upon the peculiar subaqueous existence of *T. culeus*. In the original description he says:—

"These animals are very abundant in the extensive beds of weeds which occur on the bottom of Lake Titicaca. They feed on the molluscs, crustacea, worms, etc., and are fed upon by birds and fishes. *Marmoratus* [= *acmaricus*] was found in little creeks and marshy places, in situations indicating habits similar to the common *Rana*; during the two months of the observations *culeus* was only to be found in the lake, crawling lazily about among the weeds or half hidden by them, watching for prey. The latter was the only one found in the vicinity; the former was secured on the summit and the western slope. These animals are able to remain under for great lengths of time without coming up for air; hours of watching in clear water where many could be seen, failed to detect any approaching the surface. It is possible that they are more lively at night, when their enemies are less active. Numbers were brought up in the trawl at more than four miles from the shore. None were found on the land. The natives were positive they never left the water. All stages of the animal are represented by the specimens in the collection."

Mr. Garman in conversation, adds the following facts:—the species is far more abundant in the southern than in the northern end of the Lake. The large specimens obtained were mostly caught near Guaqui or Copacabana. None were observed or dredged in the great northern bay north of the Capachica Peninsula. Neither Garman nor the senior author, who visited Lake Titicaca in 1909 found that the Indians used *culeus* for food. This is a common custom at Lake Junin with *Batrachophrynus microphthalmus*, whose habits are very similar to those of the Titicaca frog.

The following material in addition to the type remains in the Museum of Comparative Zoölogy, of Garman's collecting, after a considerable number of specimens have been distributed to other institutions.

- 2 very large adults from Copacabana, Bolivia.
- 1 half-grown specimen from Lake Titicaca, (no further data).
- 5 half-grown specimens from Carapata Bay, Bolivia.
- 6 half-grown specimens from Desaguadero Bay, Bolivia.
- 1 half-grown specimen from Puno, Peru.
- 8 larvae from Puno, Peru.

TELMATOBIOUS AEMARICUS (Cope).

Cyclorhamphus aemericus Cope, Proc. Acad. nat. sci. Phil., 1874, p. 125.

Cyclorhamphus marmoratus Garman, Bull. M. C. Z., 1875, 3, p. 276.

Telmatobius aemericus Boulenger, Cat. Batr. Sal. Brit. mus., 1882, p. 191.

Diagnosis. A small species with smooth skin; a strong supratympanic fold; vomerine teeth present in two small or but moderately developed groups; skin loose on the sides only and belly uniformly pale.

Habitat. Reported from about Lake Titicaca (type-locality) and from other stations nearby; as from Vincocaya (Garman); Cuzco (Cope, Proc. Amer. philos. soc., 1877, p. 39); Arequipa (Garman), and Yura near Arequipa (Cope, *Loc. cit.*).

Type. Acad. nat. sci. Phil., 11,400 from Lake Titicaca, Peru.

Description of Type. Size moderate; head broader than long, much narrower than the body, its length contained in the total length of body 3.4 times; snout rounded and flat without *canthus rostralis*; nostril nearer the orbit than



FIG. 7.—*Telmatobius aemericus* (Cope). 1. Foot. 2. Hand. 3. Open mouth.

the labial border. Vomerine teeth barely visible in two small groups between the choanae which are also small; tongue moderate in size, nearly round. Interorbital space 1.1 as broad as the length of the eye, the length of the snout 1.2 as long as the length of the eye; tympanum entirely concealed and covered

by a loose flap of skin. Digits free, stout, slightly dilated at the tips; the first and second fingers equal in length and only a trifle shorter than the fourth; the elbow extended forward reaches the posterior edge of the orbit. Toes fully webbed, but the webs so fully notched that they appear only half webbed; a free border of skin on the inner side of the tarsus and another on the outer side of fourth toe; subarticular tubercles slightly developed; a distinct inner and a low outer metatarsal tubercle; heels nearly in contact when the hind limbs are folded at right angles to the axis of the body; the tibiotarsal articulation reaches about two millimeters behind the posterior edge of the orbit when the hind limbs are carried forward along the body. Skin smooth except for a few low tubercles on the head and shoulders, the tubercles most abundant in the occipital region; clusters of horny spines, characteristic of the male in the breeding season, grouped on the chest and outer side of thumb; a well-developed supratympanic fold which extends to the groin; two transverse folds and a number of flat tubercles just posterior to the angle of the mouth; several folds on the sides of the body; two loose flaps of skin extending the length of the posterior side of the thighs.

Color above dark brown indistinctly mottled and spotted with darker brown, color below uniform yellowish grey.

Dimensions.

Tip of snout to vent.....	46	mm.
Tip of snout to posterior end of mandibular bone.....	16	"
Greatest width of head.....	15.5	"
Fore leg to tip of longest finger.....	28	"
Hind leg to tip of longest toe.....	64	"

Remarks. Cope says in the type description:—"Labial integument largely free and overhanging the lower jaw." We have examined carefully the five paratypes (Acad. nat. sci. Phil. 1,435-1,457, 16,177, 16,178) and it is certain that the labial integument of the type-specimen has been artificially torn away from the skull. The paratypes are much better preserved than the type and the labial integument of each one is normal. The labial integument is likewise attached to the skull, normally, of course, in the ten specimens, nine from Vincocaya and one from Arequipa (M. C. Z.).

TELMATOBIOUS JELSKII (Peters).

Pseudobatrachus jelskii, Peters, Monatsb. Berl. akad., 1873, p. 415.

Cyclorhamphus marmoratus Günther, P. Z. S. London, 1859, p. 89.

Telmatobius jelskii Boulenger, Cat. Batr. Sal. Brit. mus., 1882, p. 191.

Diagnosis. A medium-sized frog with smooth, somewhat loose skin; with a strong supratympanic fold; vomerine teeth not greatly developed, in two small groups; the tibiotarsal articulation reaching nearly to the eye and having a dark sooty grey ventral surface except for the throat which is conspicuously pale.

Habitat. Mountain streams of the high Andes of Central Peru.

Description. Adult M. C. Z. 4,796 from Tarma, Central Peru 1916; John M. Boutwell.

Size moderate; head scarcely broader than long, about equal to width of body, its length contained in total length of body $3\frac{1}{5}$ times; snout declivous, rounded, somewhat projecting, without *canthus rostralis*; nostril slightly nearer orbit than tip of snout. Vomerine teeth in two tiny groups, very feebly developed, situated directly between and nearly touching the choanae; each aperture being much larger than a group of the teeth; tongue moderate, slightly longer than broad. Interorbital space very slightly wider than upper eyelid; the length of the snout one and one half times that of the eye; tympanum hidden. Digits free, scarcely dilated at the tips, the first finger equal to the second, much shorter than the fourth; the elbow extended forward reaches the center of the eye. Toes extensively webbed, but webs incised to appear but half developed; a distinct tarsal fold; subarticular tubercles distinct, the inner metatarsal twice as long as the outer; heels just touching when the hind limbs are folded at right angles to the axis of the body; the tibiotarsal articulation reaching the posterior border of the eye when the hind limb is carried forward along the body. Skin above glandular, smooth or slightly spiny, a well-developed dermal lateral fold from orbit to groin; skin on sides of body very loose and baggy; abdominal area ill-defined by folds; skin of thighs loose and baggy also.

In the male described, there is a prominent area covered with fine asperities on the chest as well as the usual digital asperities, which on the thumb are extraordinarily developed.

Color uniform slate above, faintly spotted with darker; ventral surface dirty yellow washed with dusky grey; a pale area beneath each thigh; throat pale, unspotted.

Dimensions.

Tip of snout to vent.....	55 mm.
Tip of snout to angle of jaw.....	20 "
Greatest width of head.....	21 "
Fore leg to tip of longest finger.....	32 "
Hind leg to tip of longest toe.....	79 "

Remarks. This species, described by Peters, was obtained during Count Jelski's journey in Peru, and the type-locality is the small

village of Acancocha near Vitoc. At our request Mr. John M. Boutwell, a mining geologist at the Cerro de Pasco mines, kindly made a special effort to secure a series of this little-known species. He procured two lots of beautifully prepared examples from near Tarma and Palca, two stations in the Oroya district and practically topotypes.

TELMATOBIOUS MONTANUS Philippi.

Telmatobius montanus Philippi, Supl. Batr. Chilenos Santiago, 1902, p. 47.

(?) *Telmatobius aemericus* Werner, Zool. jahrb. Suppl., 1897, 4, p. 263.

(?) *Telmatobius marmoratus* Werner, Zool. jahrb. Suppl., 1897, 4, p. 263.

Diagnosis (extracted from original description). Indistinguishable from *T. laevis* except for the narrower head and the toes which are fully webbed.

Habitat. A lake in the high Andes of the Province of Santiago, Chile.

Remarks. *Telmatobius montanus* is evidently the water-form of *T. laevis*. It bears the same relation to *T. laevis* which *T. culcus* bears to *T. aemericus*. Philippi in describing *T. laevis* states that it comes from a pasture, while he states clearly that *T. montanus* was found in a lake. If Philippi's descriptions may be relied upon, it is very probable that the same evolution with change of structure has taken place in Chile as well as in the Andes of southern Peru, where there has been a change from a land to a completely aquatic mode of life.

TELMATOBIOUS LAEVIS Philippi.

Telmatobius laevis Philippi, Supl. Batr. Chilenos, Santiago, 1902, p. 43.

Diagnosis (extracted from original description). No vomerine teeth; choanae very large. Nostrils nearer the eye than the tip of the snout. Tympanum hidden, covered by undifferentiated skin. Toes one fourth webbed. Skin entirely smooth, no glands on any part of the body. Color above black, no trace of markings; ventral surface light grey, similarly without markings, fingers somewhat lighter in color, especially at the point.

Habitat. Chile; range probably restricted to some of the pasture-lands of the Andes. Philippi (*Loc. cit.*, p. 44) states that the type-specimens come from "Potrero," in other words from a pasture.

There are five towns known as Potrero in Chile. The specimens probably came from some one of these localities rather than from some wholly indefinitely located pasture.

TELMATOBIUS MARMORATUS (Duméril and Bibron).

Cycloramphus marmoratus Duméril et Bibron, *Erpét. gén.*, 1841, 8, p. 455.

Cyclorhamphus marmoratus Peters, *Monatsb. Berl. akad.*, 1873, pl. 2, fig. 2, pl. 3, fig. 3.

Telmatobius marmoratus Boulenger, *Cat. Batr. Sal. Brit. mus.*, 1882, p. 192.

Diagnosis (extracted from original description). Vomerine teeth in two very small groups between the choanae. Toes half webbed. The tarso-metatarsal joint reaches the tip of the snout when the hind leg is extended forward. Skin perfectly smooth, neither glands nor tubercles on any part of the body. Ground-color above grey varying to brown; upper surface marbled with black and generally irregularly covered with little white spots. Ventral surface grey, with or without black marblings, the appendages darker than the throat or abdomen.

Boulenger (1882, p. 192) adds in part to this description:—Choanae large. Tympanum small, hidden. The hind limb carried forward along the body, the tibiotarsal articulation does not reach the eye. A flat parotoid gland frequently indistinct.

Habitat. Huasacona, a hacienda in the District of Asángaro, Department of Puno, Peru.

Remarks. Duméril and Bibron (1841, p. 455) in describing the species say:—

“Cette espèce est une découverte faite au Chili par M. Pentland; le lieu où elle a été trouvée par ce savant naturaliste se nomme Guasacona.”

We have made a vain search for this locality in all the old maps and statistical volumes at our disposal. There seems to have been no locality by that name in either Chile or Bolivia. There is, however, in Peru just one Guasacona, a hacienda of 221 (*Resumen *** habitantes del Peru en 1876, 1878, p. 104*) or 427 (*Soldan, Dice. geogr. estad. Peru, 1877, p. 427*) inhabitants. *Telmatobius marmoratus* has been recorded from Chile by Werner (1897, p. 263), but this is most probably a case of misidentification. There is no good evidence to show that any specimens of *T. marmoratus* besides the types have ever been taken.

TELMATOBIOUS ANGUSTIPES (Cope).

Cyclorhamphus angustipes Cope, Proc. Amer. philos. soc., 1877, **17**, p. 38.

Telmatobius angustipes Boulenger, Cat. Batr. Sal. Brit. mus., 1882, p. 192.

Diagnosis. A rather small species, with smooth skin, no supratympanic fold; vomerine teeth present and moderately developed; the tibiotarsal articulation reaching the anterior border of the eye and in color uniform brown above.

Habitat. The type of this distinct and long-legged species formed a part of the collection of Prof. James Orton's fruitful journey to Peru in 1876-77. The single example which Cope described came from Juliaca, a few miles west of Lake Titicaca, a desolate old town at an altitude of 12,550 feet.

Type. Acad. nat. sci. Phil. 11,389 from Juliaca, Peru; altitude 12,550 ft.

Description of Type. Size small; head exactly as long as broad, slightly narrower than body, its length contained in the total length a little more than three times; snout rounded, high but with the *canthus rostralis* obsolete, nostrils slightly nearer the orbit than the labial border. Vomerine teeth in two small groups between the choanae which are large and at an angle to each other,



FIG. 8.—*Telmatobius angustipes* (Cope). 1. Foot. 2. Hand. 3. Open mouth.

tongue longer than broad. Interorbital space 1.25 as broad as the length of the eye; the length of the snout 1.1 as long as the length of the eye; tympanum entirely concealed by the skin. Digits free, slender, without discs, the first finger a trifle shorter than the second, much shorter than the fourth; the elbow extended forward reaches nearly to the center of the orbit. Toes slender, without discs, about one third webbed; subarticular tubercles not distinct; only a slight indication of the inner metatarsal tubercle; heels slightly over-

lapping when the hind limbs are folded at right angles to the axis of the body; the tibiotarsal articulation reaches a little beyond the orbit when the hind limbs are carried forward along the body. Skin entirely smooth. No folds or creases on the body.

Color above uniform dark brown; light yellowish brown below.

Dimensions.

Tip of snout to vent.....	37	mm.
Tip of snout to posterior end of mandibular bone.....	13.5	"
Greatest width of head.....	12.5	"
Fore leg to tip of longest finger.....	24	"
Hind leg to tip of longest toe.....	58	"

Remarks. *Telmatobius angustipes* is closely related to *T. marmoratus*, but differs from it in several characters, the most important of which is the greater leg length. It is only in a country of such striking physiographic barriers as Peru that two species so closely related may occur so near each other.

BUFONIDAE.

BUFO MARINIS (Linné).

This extremely widespread species was met with at Palambla (8 specimens), Perico (6 specimens) and at Chumayo (5 specimens) while a large series of tadpoles and very young were secured at Bellavista.

BUFO SPINULOSUS Wiegmann.

This wide ranging Andean toad was found at Huancabamba where three large adults were caught and at Chumayo where three others were taken. These bear close comparison with specimens from southern Peru and the mountains of Chile and Argentina.

BUFO TYPHONIUS (Linné).

This form so characteristic of the tropical lowlands of South America was found abundantly at Perico, Bellavista, and Querocotilla while four were found in the rain forest at Tabacónas.

HYLIDAE.

GASTROTHECA MONTICOLA, sp. nov.

Diagnosis. Closely related to *G. marsupiatum* from which it may be distinguished by the following characters: — Vomerine teeth in two straight confluent series on a level with the hinder edge of the choanae. Snout a little longer than the diameter of the eye. Loreal region slightly concave. Interorbital space once and a third the diameter of the eye, strongly concave. Toes two thirds webbed. The hind leg being carried forward along the body the tibiotarsal articulation reaches between the eye and the nostril. Skin smooth or finely granular above, generally granular on the head and sides. Size large, the pouched female at least sixty-one millimeters from snout to vent, generally sixty-eight millimeters, coloration somewhat different from *G. marsupiatum*; female with irregular dark blotches on the back, never forming two symmetrical stripes as in that species.

Range. Only known from the low central Andean range of northern Peru from Huancabamba south to Quercotilla.

Type. M. C. Z. 5,290 from Huancabamba, northwestern Peru; 15 August, 1916, G. K. Noble.

Description of Type (adult female with empty pouch). Size large; head about as broad as the body, much broader than long; snout blunt forming a semicircle with distinct *canthus rostralis* and concave loreal region; orbital diameter equals the distance of the eye from the nostril, which is very near the end of the snout; interorbital space about twice as broad as an upper eyelid. Tongue large oval, slightly emarginate behind. Vomerine teeth in two ovoid groups, touching each other and forming a straight line between the posterior halves of the choanae. Tympanum three fifths the size of the orbit. Fingers with a very slight rudiment of a web; the first finger equal in length to the second; toes two thirds webbed, *e. g.* two inner toes webbed to base of penultimate phalanx, third to middle of penultimate, fourth about one third the length of the antepenultimate and fifth almost to the end of the penultimate; discs distinct, about one third of their width broader than the penultimate phalanx, distinctly narrower than the width of the tympanum; subarticular tubercles well developed; a large inner metatarsal tubercle and a distinct fold along the inner side of the tarsus. Tibiotarsal articulation reaches the nostril, or not quite so far. Skin finely granular on the back, coarsely granular on the sides and very coarsely granular on the ventral surface; a slight indication of a dorsolateral fold.

Color in alcohol generally bluish grey above; a dark greyish spot between the eyes; a broader one in the scapular, and a narrower one in the iliac region. (In life the ground-tone was brilliant green, and the pattern was dark brown),

a dark stripe along the *canthus rostralis* and dorsolateral fold; sides of the body heavily marbled with black and white; lips white; appendages barred with greyish brown; posterior surfaces of the thighs and under sides of the legs mottled with dark brown; ventral surface of the head and body white, immaculate.

Dimensions.

Distance from snout to the vent.....	63 mm.
Greatest width of head.....	23 "
Distance from axilla to tip of largest finger.....	40 "
Distance from groin to tip of largest toe.....	101 "

Remarks. *Gastrotheca monticola* is readily distinguishable from all the specimens of *G. marsupiatum* examined by its much larger size. The several pouched females of *G. marsupiatum* in the M. C. Z. from Ecuador vary from 43 to 48 millimeters in length (snout to vent), while none of the ten pouched females of *G. monticola* in our series are less than 61 millimeters in length.

Unlike *G. boliviana* and perhaps other species of *Gastrotheca*, this species exhibits a well-marked sexual dimorphism. The males in life were always some shade of tan and were heavily blotched with brown. These markings often formed a)(-shaped figure in the pectoral region. The females were always green and were less heavily marked. Sometimes the females were uniformly green above except for the eye-stripe and a few dark markings on the sides of the body.